

United States District Court, Northern District of Illinois

Name of Assigned Judge or Magistrate Judge	Ronald A. Guzman	Sitting Judge if Other than Assigned Judge	
CASE NUMBER	02 CR 137	DATE	12/5/2003
CASE TITLE	USA vs. RONALD MIKOS		

[In the following box (a) indicate the party filing the motion, e.g., plaintiff, defendant, 3rd party plaintiff, and (b) state briefly the nature of the motion being presented.]

MOTION:

DOCKET ENTRY:

- (1) ☐ Filed motion of [use listing in "Motion" box above.]
- (2) ☐ Brief in support of motion due _____.
- (3) ☐ Answer brief to motion due _____. Reply to answer brief due _____.
- (4) ☐ Ruling/Hearing on _____ set for _____ at _____.
- (5) ☐ Status hearing[held/continued to] [set for/re-set for] on _____ set for _____ at _____.
- (6) ☐ Pretrial conference[held/continued to] [set for/re-set for] on _____ set for _____ at _____.
- (7) ☐ Trial[set for/re-set for] on _____ at _____.
- (8) ☐ [Bench/Jury trial] [Hearing] held/continued to _____ at _____.
- (9) ☐ This case is dismissed [with/without] prejudice and without costs[by/agreement/pursuant to]
☐ FRCP4(m) ☐ Local Rule 41.1 ☐ FRCP41(a)(1) ☐ FRCP41(a)(2).
- (10) ☒ [Other docket entry] ENTER MEMORANDUM OPINION AND ORDER: Defendant's motion in limine to exclude Government's proposed expert testimony of Charles Peters relating to comparative bullet lead analysis is granted in part and denied in part.

- (11) ☒ [For further detail see

<input type="checkbox"/> No notices required, advised in open court. <input type="checkbox"/> No notices required. <input checked="" type="checkbox"/> Notices mailed by judge's staff. <input type="checkbox"/> Notified counsel by telephone. <input type="checkbox"/> Docketing to mail notices. <input type="checkbox"/> Mail AO 450 form. <input type="checkbox"/> Copy to judge/magistrate judge.	CG courtroom deputy's initials	U.S. DISTRICT COURT CLERK 08 DEC -8 PM 10:27 01 DEC 2003 Date/time received in central Clerk's Office	number of notices	Document Number 122
			DEC 09 2003	
			date docketed	
			date mailed notice	
			CG	
		mailing deputy initials		

Defendant was driving at the time of his arrest. Allegedly taken from that vehicle was a Remington ammunition box containing eighty .22 caliber cartridges. These items were sent to the FBI Laboratory in Washington, D.C.

Pursuant to Rule 16(a)(1)(E) the government has identified Charles Peters, an examiner for the FBI laboratory, as an expert witness. Peter's one-page Report of Examination (Exhibit 1) indicates that he has used Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) to measure the presence of seven elements in lead samples taken from bullets from the victim and bullets in twenty-five of the cartridges from the box. Based on those measurements, and using an FBI definition of what is "analytically indistinguishable" Peters claims that the bullets from the victim and all but one of the bullets from the box recovered in the Defendant's car are analytically indistinguishable from one another. Peters then concludes that because the bullets from the victim and the bullets from the ammunition box are "analytically indistinguishable," these bullets "likely originated from the same manufacturers' source (melt) of lead." Peters' Report then goes further to indicate that the cartridges originally in the ammunition box were assembled and packaged on or about November 23, 1988, suggesting that all the analyzed bullets came from the box and were assembled and packaged on that date. In addition to the one page "Report of Examination" the Government has provided written notes, pictures, and 70 pages of the printout from the ICP-OES analysis. This documentation appears to support the ICP-OES measurements done by Peters and that the bullets are "analytically indistinguishable" using the FBI's definition.

The defense is not at this time challenging the measurements themselves. However, the defense claims that the Government has supplied no underlying basis or support for Peters' conclusion that, because these lead samples are "analytically indistinguishable," the bullets from the victim and the bullets from the cartridges in the box "likely originated from the same manufacturers' source (melt) of lead." This last conclusion is important because, if true, it serves to limit the number of bullets which have the same composition and therefore makes it more likely that the bullets found in the victim's body came from the Defendant's box of bullets of indistinguishable composition. However, this is only true if all bullets which come from the same batch have the same composition and if bullets from other batches do not.¹ The probative impact of such a conclusion is also limited by the extent to which only a relatively small number of bullets came from the batch in question. Thus, the danger, the defense argues, is that the jury will assume that it is very likely that the bullets which killed the victim came from the Defendant's box of bullets when in fact and science, such a conclusion is not warranted.

The lead that is used by manufacturers to make bullets is supplied by secondary lead smelters. These smelters generally obtain lead from recycled lead-acid batteries. During the smelting process the lead is melted and purified or refined in a molten state. Antimony is added

¹ "One of the important premises underlying comparative bullet lead analysis is that different sources of lead have a different elemental composition. This premise is an important one for comparative bullet lead analysis because if most or all sources of lead had the same elemental composition, then a match between bullets would have little significance." *Government's Memorandum in Opposition to Defendant's Motion In Limine on Proposed Bullet Lead Expert Under Rule 702 of The Federal Rules of Evidence*. (Government's Memorandum), at 17. "Another important premise underlying comparative bullet lead analysis is that sources of lead are homogeneous, i.e. that bullets produced at or around the same time will have analytically indistinguishable lead content. This premise is an important one for comparative bullet lead analysis because if bullets manufactured at or around the same time were not homogeneous, then no significance could be drawn from the fact that known and questioned bullets were analytically indistinguishable." *Government's Memorandum* at 25.

if needed for purposes of hardening. Defendant argues that the lead is processed so as to keep the amount of these elements at certain acceptable and carefully controlled levels. While, as explained above, the government contends that the amount of other elements besides lead is not so closely controlled but rather depends upon whatever scrap lead and other elements the manufacturer might have on hand at the time of the melt. After melting, the lead is cast into ingots (commonly called pigs) or into cylindrical billets. The ammunition manufacturer receives the lead in this form. Manufacturers who receive ingots (pigs) remelt the lead and cast it into billets. Manufacturers who receive billets produce bullets without remelting. The billets are inserted into an extruder where the lead is formed into lead wire. The wire is cut into pieces which are then formed into individual bullets. After they are made, the bullets are then stored until they are required to fill an order. At that time, they are assembled into cartridges and packaged into boxes. The date code on the box reflects when the cartridges are packaged into boxes.

Absent some scientifically sound basis for concluding that the composition of all bullets coming from the same batch is indistinguishable, (even by the FBI's own definition of "indistinguishable"), Peters would have no basis for giving an opinion that assumes this as true, i.e., that the bullets from the body and the bullets from the Defendants box of ammunition came from the same batch because they are of indistinguishable composition. The government offers as support for Peters' conclusion that bullets with the same composition must come from the same batch, the fact that theoretically there is an infinite number of permutations which can result from the mixing of the seven elements normally found in bullet lead and that it is therefore extremely

unlikely that any two batches made at separate times would, by chance, have the same composition. The government also argues that thirty years of real world experience in this field, the scientific data that lead batches are extraordinarily unusual, and the case law recognizing both the relevance and significance of such testimony also support Peters' opinion. Further, the government points out that the process by which bullets are made is not tightly controlled. Bullet manufacturers will throw into the melt whatever odds and ends of scrap metal they happen to have in addition to the actual lead. This largely random process is even more likely to lead to a unique composition of elements for every batch. However, it is undisputed that at least some manufacturing quality control exists with respect to the composition of elements which any given bullet may have. Therefore, the number of different compositions to be found emanating from any batch of molten lead may not number in the millions, but rather may be limited by the quality control parameters of the manufacturer. To what extent such controls or other consistencies practiced in bullet manufacturing limit the actual variations in composition of bullet lead, is unknown.

It appears to us that Peters' opinions are grounded in two separate areas of expertise. The actual analysis of the two lead bullet compositions is a question of chemistry or chemical engineering. As pointed out above, this part of Peters' proposed testimony is not challenged at this time. The second portion of Peters' proposed testimony is essentially a statistical conclusion, i.e., Peters proposes an opinion as to a problem of probability. How probable is it that bullets having compositions so nearly identical as to be deemed "analytically indistinguishable" came from the same "source"? The answer to this question lies in statistical

analysis. Given sufficient information a mathematician or statistician can accurately determine the probability of a given event, such as the likelihood that two bullets with the same elemental composition would have been manufactured from the same source. Herein, however, lies the government's problem. It is best stated in the government's own brief: "Indeed, the fact that no quantitative estimates can be made does not mean that the evidence has no value, only that the process of attempting to put a quantitative estimate on this value contains so many variables that such an estimate cannot now reasonably be made." Government's Memorandum at 17. If a scientifically valid estimate cannot reasonably be made, how then can an expert give an opinion? The government's response, as we see it, is that even though an opinion cannot be given as to the precise probability of such an event, there is sufficient data from the few studies that have been made, the fact that theoretically there is an almost infinite number of permutations which can result from the mixing of the seven elements normally found in bullets as well as thirty years of real world experience in this field, and the case law recognizing both the relevance and significance of such testimony to support the conclusion that indistinguishable lead batches are extraordinarily unusual. We are not persuaded by this reasoning. It is precisely as the government states - there are too many variables, each of which could greatly affect the probability of the predicted event, to conclude that any one result is more likely than the other. Peters' ultimate conclusion is based upon a series of determinations that lack scientific accuracy. For example - on a very basic level, there is no precise or even generally accepted definition of what a "source" of lead for bullets is. Is a "source" defined in terms of weight of melted bullet lead from which the bullets are finally extruded or is it defined by the length of time during which the manufacturing process runs, or is it a combination of both? The likelihood of

homogeneity in elemental composition of all bullets coming from a batch which is poured over the course of several days and consists of tens of thousands of pounds of molten lead may be quite different from the likelihood of homogeneity in composition of bullets coming from a batch which is poured over the course of only a few hours and consists of only 1,000 pounds of molten lead. How often does the composition of available scrap metal which some manufacturers mix in with their bullet lead change? Is it the same over a long period of time for any particular manufacturing facility or does it change from day to day? If a source is poured over a substantial period of time, how often during this process does the mix of trace elements thrown into the melt change? Is it different for each manufacturer, or even for each batch of bullets produced? Do results differ when the "source" is from a secondary smelter from which ingots or billets are made and shipped to the manufacturer as opposed to the remelting of ingots by the bullet manufacturer itself?

Further, the reports cited by the opposing parties appear to reach contradictory results regarding both the uniqueness of the element composition of bullets prepared from the same "source" and the homogeneity of the element composition of bullets prepared from the same source. None of these studies involve an adequately representative and randomly selected sample which could support or rebut general conclusions as to the validity of the government's underlying principles for all lead bullet analysis situations. Both sides agree that bullets with the same elemental composition can result from different sources or melts of lead. The government argues that this is a random occurrence with an extremely small probability. But, in truth, no one can say with any reasonable degree of scientific certainty what the probability or even the range

of probabilities is.

The government references the FBI's "historical data base" as support for its position here. According to the Government's Memorandum, the FBI database contains 27,000 samples from approximately 1,837 different sources. (Government's Memorandum at 22, fn 20.) As Defendant points out the government fails to provide information about the source of these 27,000 samples, how they were selected, and, assuming they were gathered over the last thirty years, whether they were collected at the same rate during the last thirty years, or whether their collection concentrated in a certain time period or came from any particular geographic location. The defense argues that the 27,000 samples actually come from only 9,000 bullets. (Three samples are taken of each bullet, resulting in 27,000 samples.) Further, the defense argues the 9,000 bullets consist of bullets, bullet fragments, or shotgun pellets sent in by various law enforcement offices for analysis. The important point, however, is that the record before us does not reflect that the samples were gathered in any approved scientific manner so as to be considered as representative of the bullet population as a whole. The samples were not randomly collected according to any scientifically accepted sampling method. For these reasons, Defendant concludes, the FBI's historical database fails to satisfy accepted scientific methodology and, consequently, cannot form the basis for expert opinion testimony under the requirements of *Daubert*. The court agrees.

Moreover, if Defendant's statistics are correct, a sample of 1,837 is extremely small to be used to reliably extrapolate principles as to the total bullet population. According to the

Defendant, the United States produces approximately 5,000,000,000 bullets per year, so the bullet production over the thirty years represented by the FBI database equals 150 billion bullets. While an expert in statistics may be able, once the precise variables in the manufacturing process have been established, to design a study which need only utilize a seemingly very small sample size, that is not the case before us. The Court is not convinced that general conclusions upon which to base an expert opinion as to the source of bullets can be based upon results documented in the FBI's historical database. An expert opinion can carry a great deal of weight with the trier of fact. For this reason expert opinions must be based upon reliable data. In this case, which involves an opinion as to probability, that means that there must be some basis in support of the opinion that a statistician or mathematician would consider to be at least arguably scientifically valid. Peters' experience in the field and the FBI's experience over the last 30 years as reflected by its database lack scientific methodology and are therefore, in essence, anecdotal evidence. As such they ought not to be utilized as a basis upon which to construct an expert opinion. The number of samples collected and comparisons done by both Peters and the FBI may seem great, but given the number of bullets produced every year and the fact that the FBI database spans thirty years, the relevant population is huge. It is therefore not safe, no matter how tempting, to draw conclusions from such prior experiences unless scientific standards have been incorporated to assure that a representative sample has been obtained. As pointed out above, that has not been done in this case. For this reason, the government's argument that the Defendant's criticisms go to the weight of the proposed expert testimony and not its admissibility is not convincing. Because the testimony comes in the form of an opinion from an expert in chemical analysis, the jury is quite likely to believe that his opinion as to the source of the bullets also comes from the

application of rigorous scientific standards. That is not so. Nor is it sufficient to rely upon cross-examination to counter the effects of an opinion that is not founded upon facts established by valid scientific methodology.

The inability of these "studies" to provide a basis for Peters' testimony is illustrated by the government's argument that "the level of bismuth in the questioned and known bullets in this case is remarkably unusual." (Government's Memorandum at 21) But as the defense points out, "remarkably unusual" as compared to what? The government admits that it has no data from Remington as to the bismuth levels in the .22 caliber bullets they have manufactured over many years. Moreover, bismuth contents in the range of 330-370 ppm up to 500 ppm can be found in the FBI's own database. There is, therefore, absolutely no way to know if the bismuth level in these bullets is in fact "remarkably unusual". It may be so in Peters' experience, but as we have pointed out, given the huge population with which we are concerned (in the billions), Mr. Peters' experience is no more than anecdotal evidence. Such evidence can be particularly misleading because it appears logical and reasonable. If agent Peters has not, in years of experience and after hundreds of analyses, previously encountered such a high quantity of bismuth, then why should we not conclude that this is a highly unusual occurrence? The answer to that question lies in the huge size of the bullet population and the relative insignificance of agent Peters' own personal experience in such a huge population. An expert witness opinion on an issue of chemical analysis and comparisons can carry with it the imprimatur of great learning, advanced technology and scientific validity in the mind of the trier of facts. Juries often tend to give such testimony great weight. Given the lack of scientific foundation for the opinion, the government's expert ought

not to be allowed to opine as to a common source for the bullets recovered from the Defendant and those recovered from the body of the victim.

Rule 702 of the Federal Rules of Evidence provides

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Under Rule 702, trial courts act as gatekeepers, to "ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 589 (1993). The Rule 702 inquiry focuses on the "scientific validity of the principles that underlie" the proposed testimony. *Id.* at 594-95. Such "scientific validity" is required to satisfy the Rule's requirements of relevance and reliability. *Id.*

To be reliable under Rule 702, expert testimony must constitute "scientific knowledge."

As the United States Supreme Court explained:

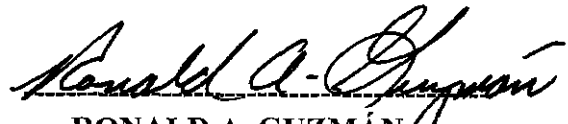
The adjective "scientific" implies a grounding in the methods and procedures of science. Similarly, the word "knowledge" connotes more than subjective belief or unsupported speculation. [I]n order to qualify as "scientific knowledge," an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation -- i.e., "good grounds," based on what is known. In short, the requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.

Id. at 590. (Footnote omitted).

We understand that the FBI Laboratory has performed comparative bullet lead analysis (CBLA) for many years. Furthermore, we understand that persons from the FBI Laboratory, including Charles Peters, have for years been allowed to testify at trials as to their opinions regarding the source of tested bullets based on CBLA. In our opinion, however, the required standard of scientific reliability is met only as to the proposed opinion testimony that the elements composition of the bullets recovered from the body is indistinguishable from the composition of the bullets found in the Defendant's car. There is no body of data to corroborate the government's expert's further opinion that from this finding it follows that the bullets must or even likely came from the same batch or melt. The motion to exclude the expert testimony of Charles Peters relating to comparative bullet lead analysis is therefore granted in part and denied in part.

SO ORDERED

ENTERED: 12/5/03


RONALD A. GUZMÁN
United States Judge